stations a variety of methods of computation is necessarily allowed, as shown by the notes appended to Table II. The mean temperatures given in Table III for Canadian stations are the simple means of 8 a. m. and 8 p. m. simultaneous observations.

The *regular diurnal period* in temperature is shown by the hourly means given in Table V for 29 stations selected out of 82 that maintain continuous thermograph records.

The *distribution of the observed monthly mean* temperature of the air over the United States and Canada is shown by the dotted isotherms on Chart IV; the lines are drawn over the Rocky Mountain Plateau region, although the temperatures have not been reduced to sea level, and the isotherms, therefore, relate to the average surface of the country occupied by our observers; such isotherms are controlled largely by the local topography, and should be drawn and studied in connection with a contour map.

Considered by districts the mean temperatures of the current month show departures from the normal as given in Table I. The greatest positive departures were: North Dakota, 9.5; upper Mississippi, 7.9; Missouri Valley, 9.0. The greatest negative departures were: Florida Peninsula, 1.8; north Pacific, 0.8.

In Canada, Prof. R. F. Stupart says:

> The mean temperature of the month exceeded the average by 8° to 10° in Manitoba, and thence both westward and eastward the excess diminished. Alberta showed an excess of from 2° to 4°, and near the British Columbia Coast the mean was very nearly average. Eastward, Thunder Bay, Algoma, and Nipissing districts and counties near Lake Huron showed an excess of from 3° to 5°; near Lake Ontario and along the upper St. Lawrence the temperature was just average, and in Quebec and the Maritime Provinces ranged from average to about 2° below.

Accumulated monthly departures from normal temperatures from January 1 to the end of the current month are given in the second column of the following table, and the average departures are given in the third column, for comparison with the departures of current conditions of vegetation from the normal condition.

Districts.	Accumulated departures.		Districts.	Accumulated departures.	
	Total.	Average.		Total.	Average.
	°	°		°	°
New England	+ 3.9	+ 0.4	Southern Slope	0.0	0.0
Middle Atlantic	+ 1.6	+ 0.2	Florida Peninsula	— 1.8	— 0.2
South Atlantic	+ 1.3	+ 0.1	Southern Plateau	— 5.2	— 0.6
East Gulf	+ 2.9	+ 0.3	Middle Plateau	— 5.7	— 0.6
West Gulf	+ 9.0	+ 1.0	Middle Pacific	— 2.8	— 0.3
Ohio Valley and Tenn.	+ 2.9	+ 0.3	South Pacific	— 4.9	— 0.5
Lower Lake	+ 4.9	+ 0.5			
Upper Lake	+14.7	+ 1.6			
North Dakota	+ 3.7	+ 0.4			
Upper Mississippi Valley	+ 9.6	+ 1.1			
Missouri Valley	+ 9.8	+ 1.1			
Northern Slope	+ 3.0	+ 0.3			
Middle Slope	+ 8.6	+ 1.0			
Northern Plateau	+ 8.3	+ 0.9			
North Pacific	+ 0.4	0.0			

The *years of highest and lowest mean temperatures* for September are shown in Table I of the REVIEW for September, 1894. The mean temperature for the current month was the highest on record at: Memphis, 78.0; Marquette, 63.2; Chicago, 69.5; Milwaukee, 67.3; Green Bay, 66.0; Duluth, 62.6; Moorhead, 65.6; Bismarck, 67.1; Williston, 64.0; Minneapolis, 68.8; St. Paul, 67.6; La Crosse, 68.0; Davenport, 72.2; Des Moines, 73.7; Dubuque, 69.9; Keokuk, 74.4; Cairo, 75.8; Springfield, Ill., 73.2; Hannibal, 73.4; St. Louis, 77.4; Columbia, Mo., 75.8; Kansas City, 76.8; Springfield, Mo., 75.8; Topeka, 75.4; Omaha, 75.2; Sioux City, 71.8; Pierre, 71.7; Huron, 69.4; Yankton, 72.7; Rapid City, 68.8; Cheyenne, 61.8; North Platte, 70.8; Denver, 66.4; Concordia, 75.3; Dodge City, 73.2; Wichita, 75.2.

The *years of highest maximum and lowest minimum temperatures* for September are given in the last four columns of Table I of the REVIEW for September, 1896. During the current month the maxima temperatures were equal to or above the highest on record at: Eastport, 89; Portland, Me., 94; Northfield, 90; Woods Hole, 85; Block Island, 86; Narragansett Pier, 90; Harrisburg, 95; Atlantic City, 94; Lynchburg, 99; Raleigh, 98; Pensacola, 94; Louisville, 100; Indianapolis, 96; Cincinnati, 97; Parkersburg, 99; Sandusky, 96; Toledo, 95; Alpena, 94; Grand Haven, 92; Port Huron, 95; Sault Ste. Marie, 91; Milwaukee, 95; Bismarck, 102; Des Moines, 98; Hannibal, 98; Eureka, 82; Point Reyes Light, 92. The minimum temperatures were the lowest on record at: Savannah, 46; Key West, 69.

FROST.

Frost was observed as follows: Alabama, light on the 22d at Florence and Riverton. Arkansas, light frost generally on the 21st, 22d, and 23d; killing on the 21st at Keesees Ferry and Silver Springs. Colorado, light frosts occurred on the 1st, 9th, 10th, 14th, and 15th, and on other dates; killing on the 16th, 17th, 18th, and other dates. Florida, light on the 21st at Chipley, Orange Hill, and Vernon, Washington County; a very unusual occurrence. Georgia, light on the 24th and 30th at Diamond, Ramsey, and Clayton. Idaho, killing on the 3d, and on subsequent dates. Illinois, killing frost at Danville on the 20th. Indiana, killing on the 19th, and on subsequent dates. Iowa, 20th, heavy to killing frosts generally in northern portion and light to heavy in southern portion. Kansas, light frosts occurred on the 17th in Johnson County, on the 18th in Johnson and Franklin, and on the 20th and 21st in Johnson, Franklin, Marshall, Coffey, Greenwood, Wilson, Neosho, and Cherokee. Kentucky, killing at a number of places on the 21st and 22d. Maryland, killing at a few places on the 21st and 22d, also on the 26th. Minnesota, heavy frost general on the mornings of the 17th and 20th; in the southern portion of the State hardy vegetation escaped injury. Mississippi, at Pontotoc killing frost was observed on the lowlands on the 21st. Missouri, killing frost at some stations on the 20th, 21st, and 22d. Nebraska, no killing frost was observed. New England, in the northern portion general killing frost was reported on the 22d; in southern sections the frost of the 28th was commonly reported as killing. New Jersey, one station reported killing frost on the 22d and two on the 28th. New Mexico, no destructive frosts. North Carolina, killing frosts at Biltmore, 30th; Linville, 21st, 29th, and 30th; Waynesville, 30th. Oklahoma, no killing frosts were observed. Ohio, killing frosts on 18th, 20th, 21st, 22d, and other dates. South Dakota, killing frosts on the 15th, 16th, and 17th. Tennessee, general frosts on the 21st, 22d, and 23d; some damage was done to tobacco and tender vegetation. Virginia, killing frosts at elevated stations on the 21st, 22d, 29th, and 30th. West Virgina, killing frosts on the 20th, 22d, and other dates; damage slight. Wisconsin, killing frost on the 20th.

MOISTURE.

The *quantity of moisture* in the atmosphere at any time may be expressed by the weight of the vapor coexisting with the air contained in a cubic foot of space, or by the tension or pressure of the vapor, or by the temperature of the dew-point. The mean dew-point for each station of the Weather Bureau, as deduced from observations made at 8 a. m. and 8 p. m., daily, is given in Table I.

The *rate of evaporation* from a special surface of water on muslin at any moment determines the temperature of the wet-bulb thermometer. The mean wet-bulb temperature is now published in Table I; it is always intermediate, and generally about half way between the temperature of the air

and of the dew-point. The quantity of water evaporated in a unit of time from the muslin surface may be considered as depending essentially upon the wet-bulb temperature, the dew-point, and the wind.

The *relative humidity*, or the ratio between the moisture that is present in the air and the moisture that it would contain if saturated at its observed temperature is given in Table I as deduced from the 8 a. m. and 8 p. m. observations. The general average for a whole day, or any other interval, would properly be obtained from the data given by an evaporometer, but may also be obtained, approximately, from frequent observations of the relative humidity.

PRECIPITATION.

[In inches and hundredths.]

No rain fell during the month over a considerable area in northern Mississippi, western Tennessee, and parts of the adjoining States of Kentucky, Alabama, Louisiana, and Arkansas. In all there were 18 States in which the measured rainfall at one or more stations was a trace or less.

The rainfall of September is heaviest on the average along the Gulf and Atlantic coasts and over the Peninsula of Florida. Smaller areas of comparatively heavy rainfall are to be found over the lower St. Lawrence Valley and the upper Lake Region, while a fourth area occasionally appears over or west of the Continental Divide in New Mexico and Arizona.

The rainfall of September along the Gulf Coast is subject to very great variations from year to year. The heavy fall on the coast line, moreover, does not, as a rule, extend far inland; thus, in 1879, while a total of 15 inches fell on the Texas Coast, there was barely an inch 150 miles inland in a northeasterly direction. The rainfall of September in the central interior valleys and the Lake Region comes almost wholly in the form of local showers and the distribution is consequently very irregular. Furthermore, there is almost without exception regions of deficient rainfall in the central and eastern portions of the United States whose magnitude and position vary with each successive year. During the last ten years the dry regions were located as follows:

1888.—In the Missouri and Mississippi valleys, portions of the Ohio Valley, Louisiana, and Arkansas.

1889.—In North Carolina, Georgia, Mississippi, Louisiana, Michigan, Minnesota, and Nebraska.

1890.—In the upper Missouri Valley and central Illinois.

1891.—Generally deficient rainfall throughout the Mississippi Valley, Tennessee, Georgia, Virginia, and West Virginia.

1892.—In the Mississippi and Missouri valleys.

1893.—In the upper Missouri Valley and lower Lake Region.

1894.—In the upper Missouri Valley.

1895.—Gulf States, Georgia, North Carolina, South Carolina, Virginia, West Virginia, Ohio, and Kentucky, a month of generally deficient rainfall.

1896.—Mississippi, Alabama, and portions of Georgia. Generally heavy elsewhere, except in the upper Missouri Valley.

While the rainfall of September, 1897, over almost the entire territory east of the one hundredth meridian was below the normal, the deficiency was most marked in the middle and lower Mississippi Valley, the Ohio Valley, the lower Lake Region, and the Middle Atlantic Coast, a region, it will be remembered, over which unusually heavy rains fell in March and April last. The central region of heavy rains in March last (see Chart III, March, 1897, REVIEW) is almost identical with the area of least rainfall, as shown on Chart III of this REVIEW.

During the sixty-one days that ended September 30 less than 50 per cent of the normal amount of rain fell in practically the whole of the Ohio basin and the greater portion of the Mississippi and Missouri basins. At St. Louis, Springfield, Mo., Indianapolis, and Cairo less than 25 per cent of the normal amount of rain fell during the period above mentioned.

While there has been general drought east of the Rocky Mountains, the rainfall of the eastern foothills and west of the Continental Divide in Colorado, New Mexico, and Arizona was heavier than usual. This is also true of Florida, the coast of Georgia, and portions of southern Alabama.

The *distribution of precipitation* for the current month, as determined by reports from about 2,500 stations, is exhibited on Chart III. The numerical details are given in Tables I, II, and III.

The *years of greatest and least precipitation* for September are given in the REVIEW for September, 1890. The precipitation for the current month was the greatest on record at: Jupiter, 18.09; Phœnix, 3.67. It was the least on record at: Nantucket, 1.31; Vineyard Haven, 0.80; Little Rock, 0.33; Corpus Christi, 0.98; Chattanooga, 0.07; Memphis, 0.00; Nashville, 0.19; Columbus, Ohio, 0.82; Parkersburg, 0.46; Buffalo, 0.31; Rochester, 0.46; Erie, 0.54; Springfield, Ill., 0.35; Hannibal, 0.30; Springfield, Mo., 0.37; Sioux City, 0.51; Oklahoma, 1.22. The above refers only to the stations included in Table I.

The *average departure* for each district is given in Table I. By dividing each current precipitation by its respective normal the following corresponding percentages are obtained (precipitation is in excess when the percentage of the normal exceeds 100):

Above the normal: Florida Peninsula, 163; southern Plateau, 261; northern Plateau, 134.

Below the normal: New England, 62; middle Atlantic, 35; south Atlantic, 71; east Gulf, 57; west Gulf, 38; Ohio Valley and Tennessee, 24; lower Lake, 25; upper Lake, 48; North Dakota, 43; upper Mississippi, 36; Missouri Valley, 38; northern Slope, 39; middle Slope, 50; southern Slope, 78; middle Plateau, 40; north Pacific, 68; middle Pacific, 55; south Pacific, 0.

In Canada, Prof. R. F. Stupart says:

Over British Columbia and also over the eastern portion of the Maritime Provinces the rainfall was very nearly average, and in all other portions of the Dominion, except Saskatchewan and parts of Assiniboia, it was less than average, and generally to a very pronounced extent. In Manitoba it averaged but 0.3 inch; over most of Ontario it was only from 0.3 to 0.6, and the counties of Prince Edward and Hastings alone showed about 2 inches, an amount nearly approaching average. The deficiency was also very marked in the western portions of Nova Scotia and New Brunswick.

The *total accumulated monthly departures* from January 1 to the end of the current month are given in the second column of the following table; the third column gives the current accumulated precipitation expressed as a percentage of its normal value.

Districts.	Accumulated departures.	Accumulated precipitation.	Districts.	Accumulated departures.	Accumulated precipitation.
	Inches.	*Per ct.*		*Inches.*	*Per ct.*
New England	+ 1.70	102	Middle Atlantic	— 4.60	87
Florida Peninsula	+ 9.40	123	South Atlantic	— 4.90	87
Southern Slope	+ 1.20	107	East Gulf	— 3.70	81
Southern Plateau	+ 4.20	164	West Gulf	— 8.90	73
Northern Plateau	+ 0.70	106	Ohio Valley and Tenn.	— 1.10	97
South Pacific	+ 0.70	109	Lower Lake	— 3.30	87
			Upper Lake	— 2.10	93
			North Dakota	— 0.70	96
			Upper Mississippi Valley	— 0.40	99
			Missouri Valley	— 2.80	89
			Northern Slope	— 1.60	87
			Middle Slope	— 0.20	99
			Middle Plateau	— 0.20	98
			North Pacific	— 2.70	93
			Middle Pacific	— 2.60	86